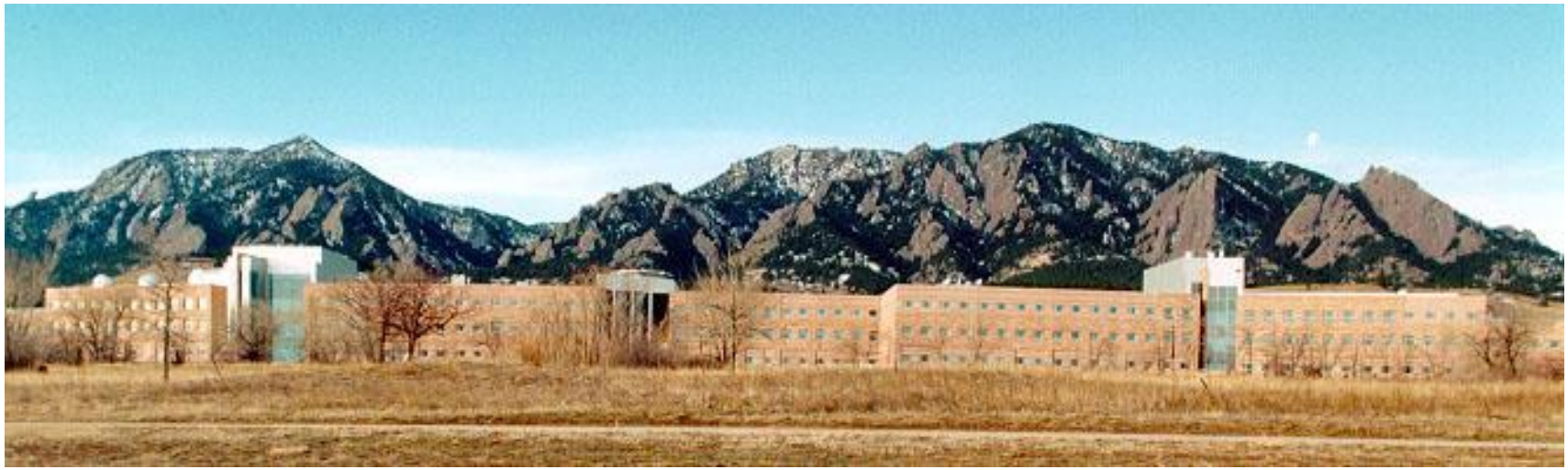

STP Quarterly Review

23 Jul 2013

3QFY13

William Denig

Solar & Terrestrial Physics Division

NOAA/NESDIS/NGDC

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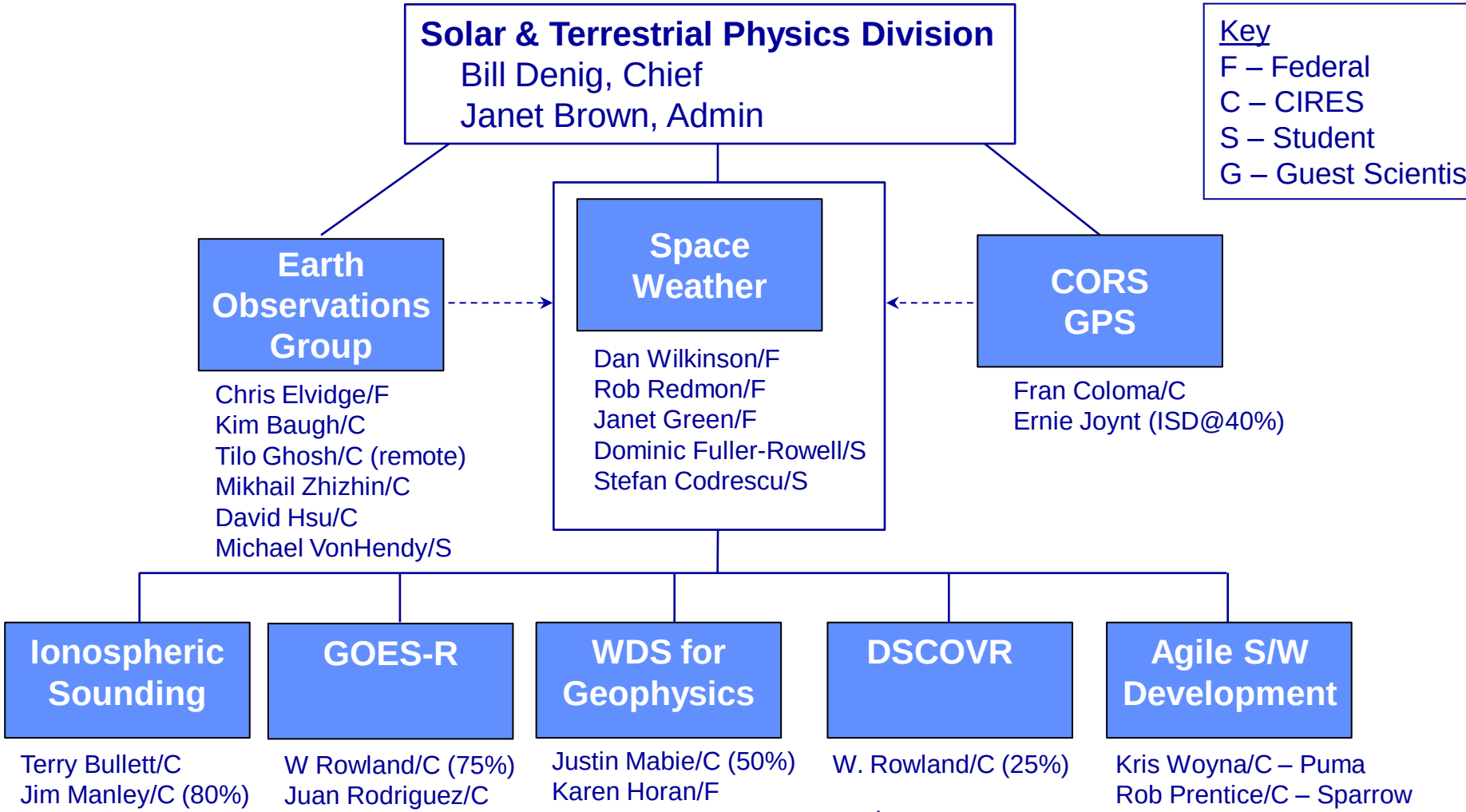
OUTLINE

Solar & Terrestrial Physics Division

- **STP Division Overview**
- **Milestones & Performance Measures**
- **Accomplishments & Updates**
- **Publications and Presentations**
- **Issues & Summary**

STP Division Overview
Personnel



Acronyms
WDS – World Data Service
CORS – Continuously Operating Reference Stations
GPS – Global Positioning System
DSCOVR – Deep Space Climate Observatory
GOES – Geostationary Operational Environmental Satellite
CIRES – Cooperative Institute for Research in Environmental Sciences

STP Division Overview
Personnel Changes

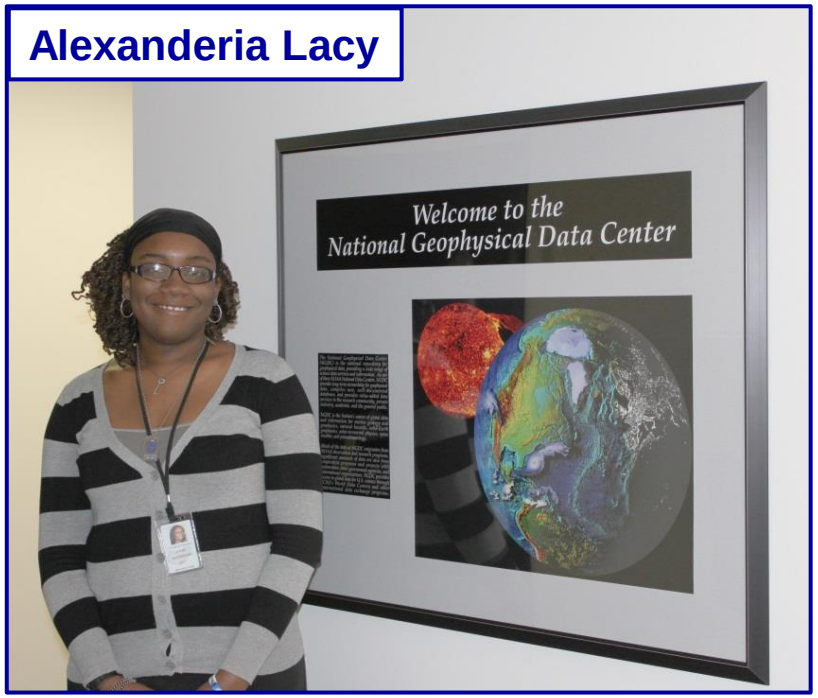
- Gains
  - Kris Woyna, Agile programmer (Team Puma)
  - Alexanderia Lacy – Summer Intern (Earth Observations Group)
- Losses
  - Paul Meade – Transitioned to CPI offices off Arapahoe
  - Radhika Stetye (student) – Graduated and has moved on
- Incoming
  - Ryoma Hattori – Visiting Scientist (Japan)
- Transitions
  - Rob Prentice – Joined Agile S/W Team Sparrow
- Vacancies
  - Fed Vacancy #1 – Solar Physicist – **critical need!**
  - Fed Vacancy #2 – GOES-R Data Manager – increasing need
  - GOES-R/DSCOVR Magnetometer Scientist / CIRES – interviewing applicants

Acronyms:
CIRES – Cooperative Institute for Research in the Environmental Sciences
DSCOVR- Deep Space Climate Observatory (Triana aka "Gore-sat)"
GOES – Geostationary Operational Environmental Satellite
GOES-R – GOES, Series R for satellites R, S, T, and U

STP Division Overview
Hail and Farewell

Kris Woyna

Alexanderia Lacy



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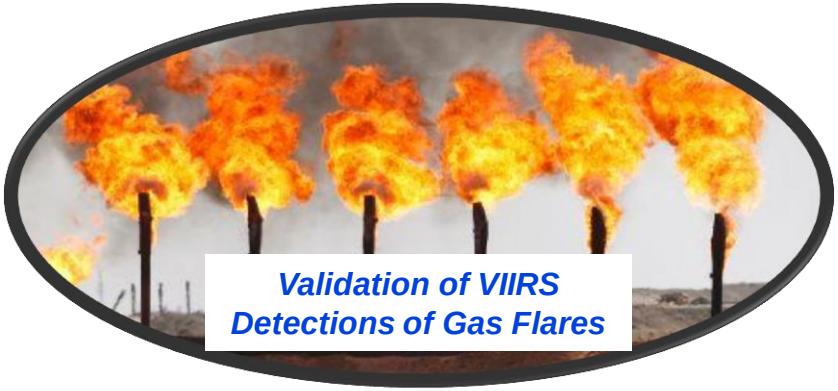


Validation of VIIRS Detections of Gas Flares

STP Division Overview
Balance Sheet – FY13

Income

	FY12 Carryovers	FY13 Income	Total	
Base Allocation (actual)		$888,794	$888,794	
Grants at CIRES		$256,929	$256,929	
NASA ROSES (Green)		$76,390	$76,390	
NASA KNIPP (Redmon)		$20,000	$20,000	
SPSRB (Redmon)		$64,400	$64,400	
GOES-R (PN76)		$137,500	$137,500	
GOES-R (PN77)		$509,620	$509,620	
GOES-R (Cal/Val)		$300,000	$300,000	
DSCOVR Data Stewardship		$244,000	$244,000	
DoD/USAF				
JPSS Imagery Team		$75,000	$75,000	
JPSS Proving Ground		$80,000	$80,000	
World Bank				
NTL Data Sales	$56,000		$56,000	
MAFFIN		$18,000	$18,000	
McMurdo (DMSP)		$56,000	$56,000	
CORS		$208,000	$208,000	
Total Income	$56,000	$2,934,633	$2,990,633	**$2,990,633**

70% of funding is from external sources

Expenses

	FY12 Paybacks	FY13 Expenses	Total	
Salaries		$2,388,334	$2,388,334	
Fed Travel		$36,654	$36,654	
CIRES Travel		$37,489	$37,489	
ISD Support		$135,773	$135,773	
Miscellaneous		$117,288	$117,288	
OD overhead		$174,731	$174,731	
FY14 Forward Funded		$100,364	$100,364	
Total Expenses		$2,990,633	$2,990,633	**$2,990,633**

Balance Sheet

	Net FY12	Net FY13	Net	
Balance Sheet	$56,000	-$55,999	$1	**$1**
			As of 23 Jul 13	

STP Division Overview
Agreements – Status

Agreements

Scope	Team	Type	Partner	NOAA Legal	DOC Legal	NGDC Signed	Partner Signed	Start	End	Status	
CORS Support	CORS	AGR	NGS	n/a	n/a	X	X	10/01/2003	09/30/2016	G	*Extension in place (FY14-16)*
SWx Climatology	SWX	MOU	AFCCC	X	X	X	X	05/27/2004	10/01/2014	G	In place - no FY13 activity
GPS Data (CORS)	SWX	MOA	Multi	n/a	n/a	X	X	09/20/2004	TBD	G	*Biannual Review - waiting on NGS*
Ionosonde Sites	SWX	IA	USGS	X	X	X	X	04/03/2009	04/03/2014	G	In place
ViRBO	SWX	MOA	NASA	X	X	X	X	04/15/2009	n/a	G	In place - *SPDF actions*
SEM-N - AFRL	SWX	MOA	AFRL	X	X	X	X	05/11/2009	05/11/2014	G	In place - DWSS cancelled
Nighttime Lights	SWX	MOU	DOE	X	X	X	X	08/12/2009	08/12/2013	G	*Renewal under discussion*
DoD/USAF	NTL	MOU	NASIC	X	X	X	X	03/09/2011	01/30/2015	G	In place - nothing to report
Gas Flaring	NTL	SA	WBank	X	X					G	Awaiting signature
Global CO2	NTL	AGR	NASA	n/a	n/a	n/a	n/a	07/29/2011	09/30/2012	G	Renewed annually
~~SEM-N Algorithms~~	~~SEG~~	~~MOU~~	~~SMC~~	~~X~~	~~X~~	~~X~~	~~X~~	~~08/01/2011~~	~~07/31/2013~~	~~G~~	*Expiring - will not renew (DWSS)*

As of 25 Jul 2013

G	No Action Needed
Y	Watch Item
R	Action Required

STP Division Overview

STP Annual Data Ingest[1] – 3QFY13

	CY11 GB	CY12 GB	CY13 YTD
GOES SEM	71	80	36
GOES SXI	1,731	1899	974
POES SEM	29	29	13[2]
DMSP OLS	5,130	5,020	2,333
CORS GPS	24,456	25,611	12,985
Ionosonde	900	907[2]	500[3]

Acronym List:
GOES – Geostationary Operational Environmental Satellite
DMSP – Defense Meteorological Satellite Program
SEM – Space Environment Monitor
SXI – Solar X-ray Imager
GPS – Global Positioning System
POES – Polar Operational Environmental Satellite
CORS – Continuously Operating Reference Stations
OLS – Operational Linescan System

[1]Uncompressed data volumes
[2]Unprocessed POES data
[3]Does not include VIPIR

STP Division Overview
GOES Spacecraft/Instrument Status

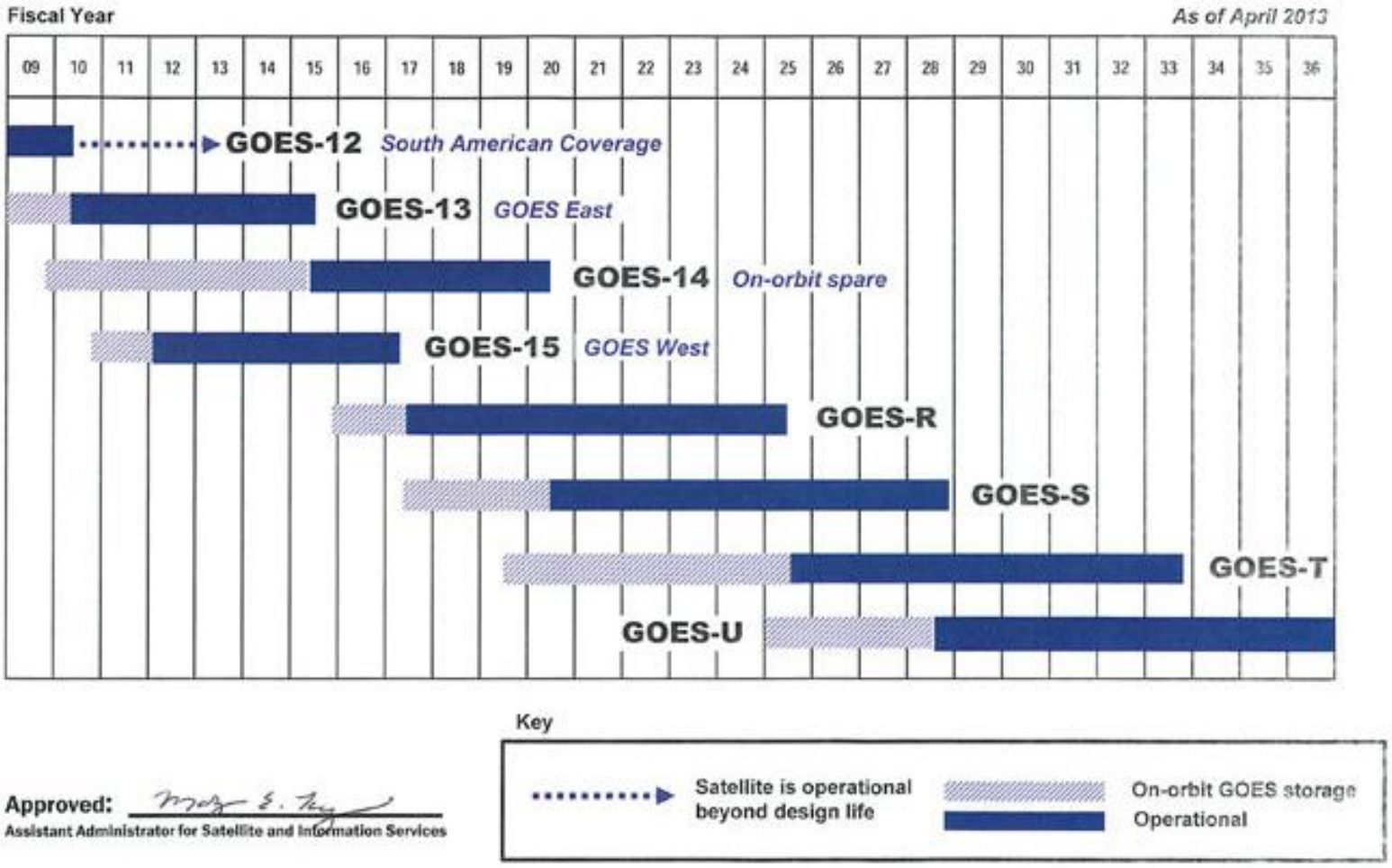
Spacecraft	Series	Operational Status	Status	Magnet1	Magnet2	Magnetometer 1	Magnetometer 2	MAG	XRS	XRS-EUV	EXIS	EPS	HEPAD	SEISS	XRP	SXI	SUVI
GOES 12	GOES I-M	South America	G	G	G				R			Y	G		R	R	
GOES 13	GOES N-O-P	Operational East	G			G	G			Y		G	G			Y	
GOES 14	GOES N-O-P	Standby	G			G	G			G		G	G			G	
GOES 15	GOES N-O-P	Operational West	G			G	G			G		G	G			G	
GOES R	GOES R	Acquisition						ACQ			ACQ			ACQ			ACQ
GOES S	GOES R	Acquisition						ACQ			ACQ			ACQ			ACQ
GOES T	GOES R	Acquisition						ACQ			ACQ			ACQ			ACQ
GOES U	GOES R	Acquisition						ACQ			ACQ			ACQ			ACQ

As of: 16 Jul 2013

Operational (or capable of)	G
Operational with limitations (or Standby)	Y
Operational with Degraded Performance	O
Not Operational	R
Acquisition	ACQ

SWPC operations use GOES-15 SEM & SXI, No GOES-14 data, GOES-13 SEM (no XRS).

STP Division Overview
Continuity of GEO Measurements



DOC IG Report: Audit of Geostationary Operational Environmental Satellite-R Series: Comprehensive Mitigation Approaches, Strong Systems Engineering and Cost Controls are Needed to Reduce Risks of Coverage Gaps. (OIG-13-024-A; 25 Apr 2013) – ***Ground system issues/recommendations***

STP Division Overview
Teaming

Intramural – Data Centers

- Janet Green presented the POES CONOPS at the 02 July Data Managers' Meeting
- Rob Redmon worked with Pat Alken (MGG) to improve DMSP magnetometer dataset
- Bill Denig participates in the Science Working Group planning for NEIO

Extramural – NESDIS – Continuing Ground System Studies:

- NESDIS Enterprise Ground System Study – Common Algorithms
  - ✓ Present a strategy to optimize algorithm processing, product quality, R2O, cost and efficiency (completed: 17 Jan 2013)
- NESDIS Common Algorithm Architecture OMB Study
  - ✓ Develop a framework for common algorithm architecture along with standardizing product data formats – *Cost Avoidance* (due: 29 Nov 2013)
- NESDIS Legacy Product Distribution (PD) Replacement OMB Study
  - ✓ Conduct a feasibility study and cost analysis of replacing disparate legacy product distribution systems with a centralized product distribution – *Cost Savings* (due: 31 Dec 2013)

Make it stop!

Acronym List

CONOPS – Concept of Operations
OMB – Office of Management and Budget
R2O – Research To Operations
POES – Polar Operational Environmental Satellite
NEIO – National Environmental Information Office
DMSP – Defense Meteorological Satellite Program

OUTLINE
Solar & Terrestrial Physics Division

STP Division Overview

Milestones & Performance Measures

Accomplishments & Updates

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Issues & Summary

Milestones & Performance Measures

FY13 STP Milestones

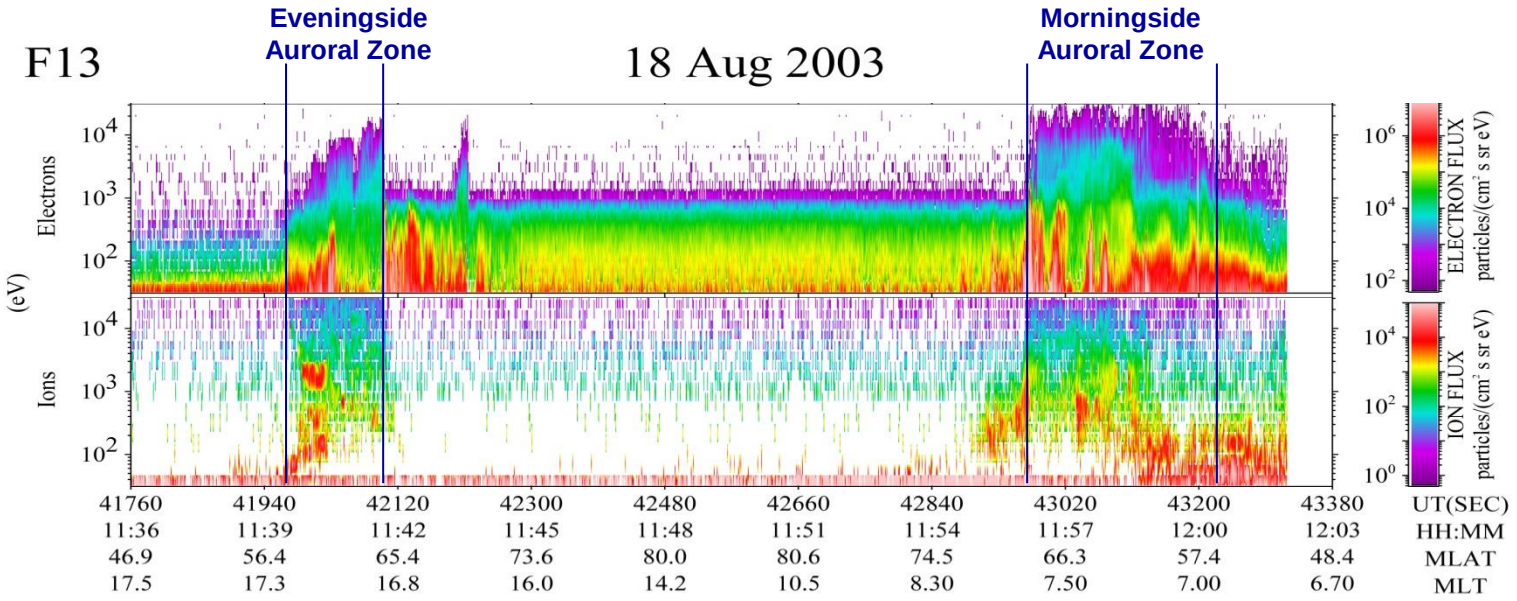
FY13 Milestones		+--------FY13--------+			
Space Weather Program		Q1	Q2	Q3	Q4
Spacecraft Charging	Host technical workshop on the release of the next generation radiation belt models referred to as AP9/AE9 (Green/1QFY13)	C			
PeEPS	Demonstrate at the American Geophysical Union 2012 Fall Meeting new capabilites for the social media utility referred to People Empowered ProductS (Green-Redmon/1QFY13)	C			
DMSP SWx	Develop an 11-year database of calibrated precipitating electron and ion fluxes from the Defense Meteorological Satellite Program Special Sensor Electron and Ion Spectrometer (Redmon/3QFY13)			C	
World Data Service					
Monthly Bulletins	Resume monthly production of the NOAA/NGDC Geomagnetic Indices Bulletin and Solar Indices Bulletin (Mabie-Clark/1QFY13)	C			
Ionosonde Data Services					
Ionosonde Installation	Promote scientific research within Africa by installing a new-generation, advanced research ionospheric sounder at Maseno University on the equator near Kisumu, Kenya (1QFY13/Bullett/1QFY13)	C			
GOES-R Program Support					
GOES-R Cal/Val	Identify and complete key tasks for GOES-R space weather calibration-validation [vice Shouldis/1QFY13]	C			
GOES-R RR/AR	Complete Critical Design Reviews for selected Level 2+ ground-processing algorithms for the GOES-R space weather sensors (vice Shouldis/3QFY13)			C	
DSCOVR Program Support					
DSCOVR RTA	Prepare and submit to the NGDC Data Manager a Request To Archive (RTA) for space environmental data from the NOAA Deep Space Climate Observatory (DSCOVR) mission (Denig/1QFY13)	C			
DSCOVR CONOPS	Prepare a high-level CONcept of Operations (CONOPS) for the Archive, Access, and Assessment (AAA) of solar wind data from the Deep Space Climate Observatory (DSCOVR) mission (Denig/1QFY13)	C			
DSCOVR SA	Draft an initial Submission Agreement (SA) for acquiring processed Deep Space Climate Observatory (DSCOVR) data received from the NWS Space Weather Prediction Center (Denig/2QFY13)		C		
SPADES	Develop key functional elements of the Satellite Product Analysis and Distribution Enterprise System (SPADES) to support the Deep Space Climarte Observatory (DSCOVR) mission (Rowland/3QFY13)			C	
DSCOVR ICD	Prepare a draft Interface Control Document (ICD) for the the NGDC-to-archive interface for the Deep Space Climate Observatory (DSCOVR) mission data (Rowland/4QFY13)				G
Earth Observations					
VIIRS Gas Flares	Use Soumi National Polar Partnership (S-NPP) Visible Infrared Imaging Radiometer Suite (VIIRS) data to produce a global map of detected gas flares ranked from largest to smallest (Elvidge/4QFY13)				G
VIIRS Nighttime Lights	Create a global cloud-free composite map of nightime lights derived from Soumi National Polar Partnership (S-NPP) Visible Infrared Imaging Radiometer Suite (VIIRS)S data (Elvidge/4QFY13)				G

As of 18 Jul 13

Milestones & Performance Measures
DMSP SSJ Database

Milestone: Develop an 11-year database of calibrated precipitating electron and ion fluxes from the Defense Meteorological Satellite Program Special Sensor Electron and Ion Spectrometer. (Redmon/3QFY13)

Status: Completed – A quality-controlled dataset of SSJ data for Solar Cycle 23 is now available in HDF5 format. Conversion to CDAWeb CDF's is currently ongoing. New dataset used in Redmon et al. [2012].

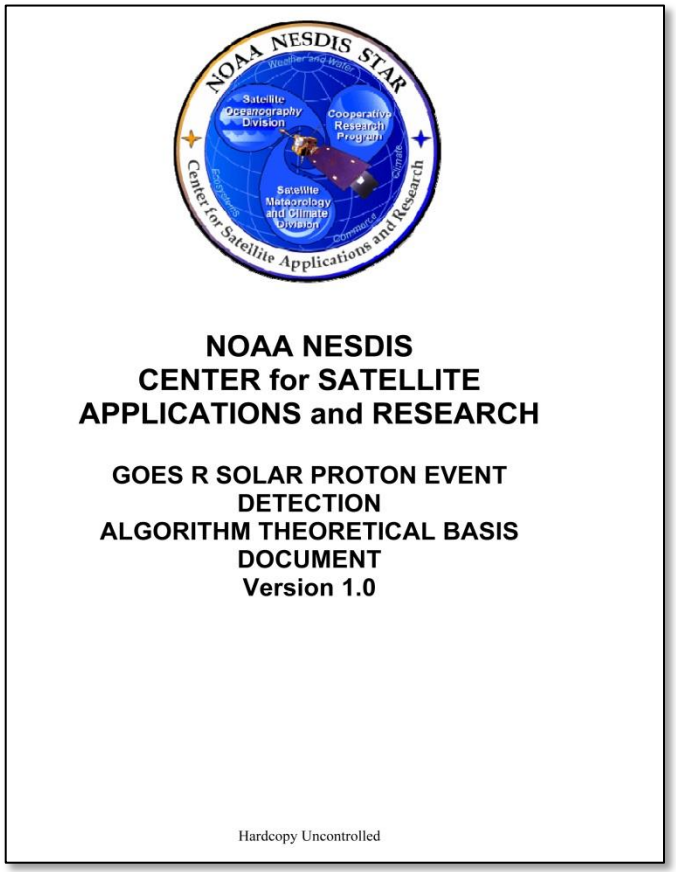


SSJ – Special Sensor Electron & Ion Spectrometer
HDF5 – Hierarchical Data Format, Version 5.x
CDF – Common Data Format

Milestones & Performance Measures
GOES-R Algorithm CDRs

Milestone: Complete Critical Design Reviews for selected Level 2+ ground-processing algorithms for the GOES-R space weather sensors. (Rowland/3QFY13)

Status: Completed – CDRs for the SEISS, SUVI and EXIT algorithms are complete. MAG algorithm CDR is planned for August 2013.



Completed Algorithm CDRs

SEISS.20a	Solar Proton Event Detection
SEISS.20b	Solar Proton Rate of Rise
SEISS.20c	Linear Energy Transfer (LET)
SUVI.13	Bright Regions
SUVI.14	Flare Location
SUVI.15	Coronal Hole Boundaries
EUVS.05	Validation of Multi-Wavelength Proxy
XRS.10	XRS Flare Location

Remaining Algorithm CDR

MAG.12	Sudden Impulse Detection

GOES-R Geostationary Operational Environmental Satellite R-Series — A collaborative mission

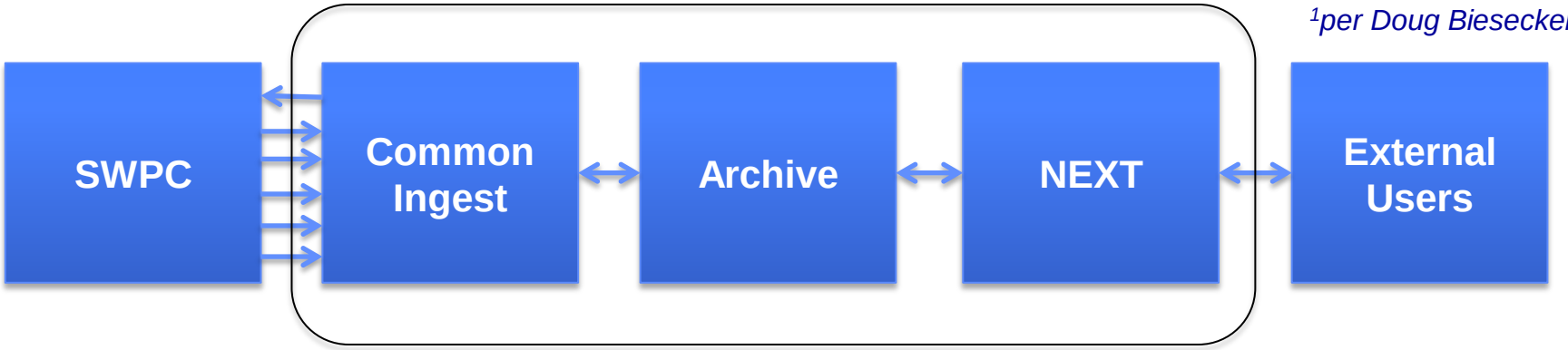
Milestones & Performance Measures
DSCOVR SPADES

Milestone: Develop key functional elements of the Satellite Product Analysis and Distribution Enterprise System (SPADES) to support the Deep Space Climate Observatory (DSCOVR) mission. (Rowland/3QFY13)

Status: Completed – Team Puma (agile) is proceeding nicely with SWPC Common Ingest for DSCOVR using Enlil as the pathfinder. Prototype DSCOVR files will be made available in August '13 for testing. Data Access will be via the Ngdc EXTract (NEXT) system.

Other News: *A Single Design Review (PDR + CDR) for DSCOVR is scheduled for 31 July at the Goddard Space Flight Center. William Rowland will represent NGDC and present the status of the NGDC Element for archive ingest and access. The DSCOVR launch has been delayed until Jan '15 (2-month launch slip[1]).*

[1]per Doug Biesecker



DSCOVR/NGDC Element

CDR – Critical Design Review
PDR – Preliminary Design Review
SWPC – Space Weather Prediction Center
DSCOVR – Deep Space Climate Observatory

Milestones & Performance Measures

FY13 Performance Measures

Space Weather Metric

Goal	Objective	Performance Measure	POC	1QFY13	2QFY13	3QFY13	4QFY13
Weather-Ready Nation (NWS)	A More Productive and Eficient Economy Through Environmental Information Relevant to Key Sectors of the U.S. Economy	Maintain a greater than 97% (2-sigma, cumulative distribution) of available Space Environment Monitor (SEM) data from the Geostationary Operational Environmental Satellites (GOES) archived on an annual basis	Wilkinson	100%	100%	100%	

Ionosonde

Goal	Objective	Performance Measure	POC	1QFY13	2QFY13	3QFY13	4QFY13
Weather-Ready Nation (NWS)	Resilient Coastal Communities That Can Adapt To The Impacts Of Hazards And Climate Change	Acquire, process and disseminate > 97% (2-sigma, cumulative distribution) of available real-time ionosonde data within 1 hour [TBD] of receipt	Bullett	100%	100%	100%	

Nightime Lights Metric

Goal	Objective	Performance Measure	POC	1QFY13	2QFY13	3QFY13	4QFY13
Climate Adaptation and Mitigation (CS)	Improved Scientific Understanding of the Changing Climate System and Its Impacts	Acquire, process and disseminate >97% (2-sigma, cumulative distribution) of available real-time nighttime lights imagery within 3 hours of receipt	Elvidge	100%	100%	100%	

CORS

Goal	Objective	Performance Measure	POC	1QFY13	2QFY13	3QFY13	4QFY13
Resilient Coastal Communities and Economics (NOS)	Resilient Coastal Communities That Can Adapt To The Impacts Of Hazards And Climate Change	Provide a >97% (2-sigma, cumulative distribution) availability for CORS near-real-time data to the NWS Space Weather Prediction Center (SWPC) as per the '4-way' Memorandum of Agreement and subject to normal business-hour response times.	Coloma	100%	100%	100%	

Greater than 99% (3-sigma) Cumulative Distribution

Greater than 97% (2-sigma) Cumulative Distribution

Greater than 84% (1-sigma) Cumulative Distribution

Below 84.1% (1-sigma) Cumulative Distribution

Note: WAAS-B was down for ~2 hours on 7/08/2013, due to router change-out. No loss of data occurred as the duplicate data stream continued to be ingested in SS.

OUTLINE
Solar & Terrestrial Physics Division

STP Division Overview

Milestones & Performance Measures

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Accomplishments & Updates
GOES-R Program Status

Current NGDC Tasks:

- Space Weather Cal/Val – NGDC is responsible for overseeing and participating in the calibration/validation of GOES-R L1b space weather products – NGDC program is currently cost constrained and limited to mostly oversight. Increased funding has been recommended (Steve Goodman to Greg Mandt) to support adopting/adapting contractor-developed L1b processing algorithms in-house. [*L1b algorithm disconnects*]
- Ground Processing Algorithm Development – NGDC is responsible for developing the "science-grade" algorithms required to produce Level 2+ space weather products. A total of 26 algorithms have been delivered in accordance with STAR standards. The remaining 7 algorithms are at a CDR level of maturity. [*No established transition path to operations – see below*]

Proposed Risk-Reduction Task and R2O Transition:

- Develop an in-house demonstration capability to process selected L2+ algorithms in advance of a formal R2O transition. Steve Goodman recommends this effort be tied to a Proving-Ground effort using GOES-NOP data. [*see below*]

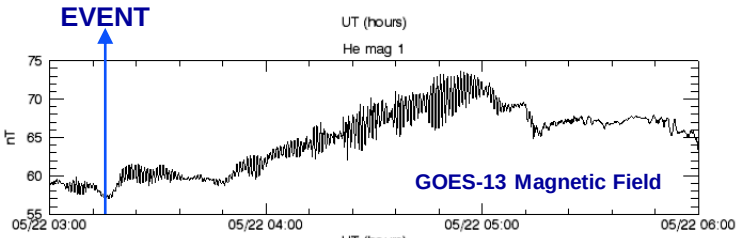
Note: NWS is conducting an "Assessment of Alternatives (AoA)" for L2+ R2O. On 19-July the NWS requested that NGDC submit a revised budget estimate for full operations; 1) SPADES demo, 2) transition to Ops, 3) sustainment.

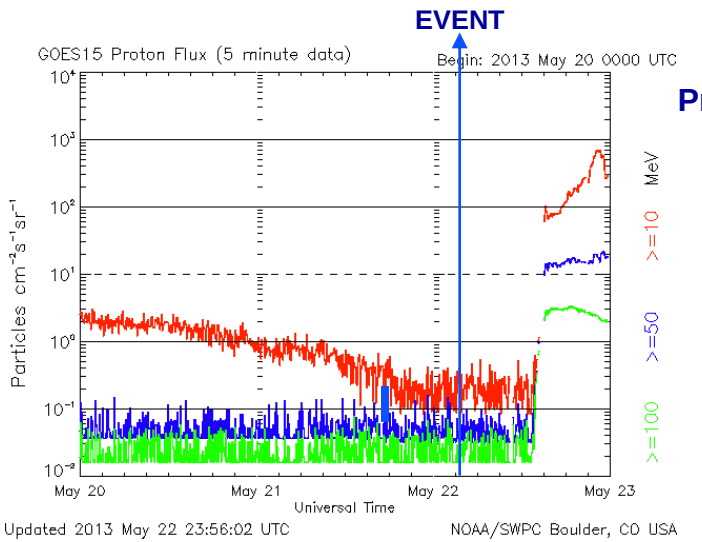
Accomplishments & Updates

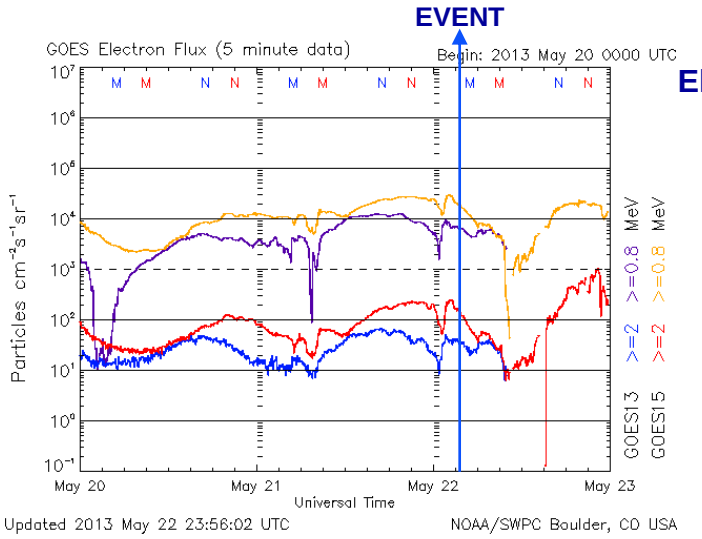
GOES-13 Anomaly Investigation

On May 22nd at 03:27 UT the GOES 13 star tracker lost lock forcing satellite into precautionary safe mode.

- ✓ NOAA SOCC Manager (Ron Mahmot) contacted STP/Green to discuss possible space weather (SWx) connection.
- ✓ Determination: *SWx cause unlikely*:
  - ⊗ Single Event Upset – significant solar proton event occurred after anomaly occurrence
  - ⊗ Internal Charging – measured MeV electron flux (fluence) low on days prior to anomaly
  - ⊗ Surface Charging – no substorm activity or related particle increases
- ✓ Oscillations seen in MAG data found to be geophysical/unrelated to GOES-13 event.
- ➢ **Likely cause – micro-meteorite impact**







Accomplishments & Updates
GOES-NOP Data in CDAWeb

STP has teamed with NASA (Bob McGuire) to make GOES NOP data available through CDAWeb. Data-provider acknowledgements to NGDC and SWPC are included.

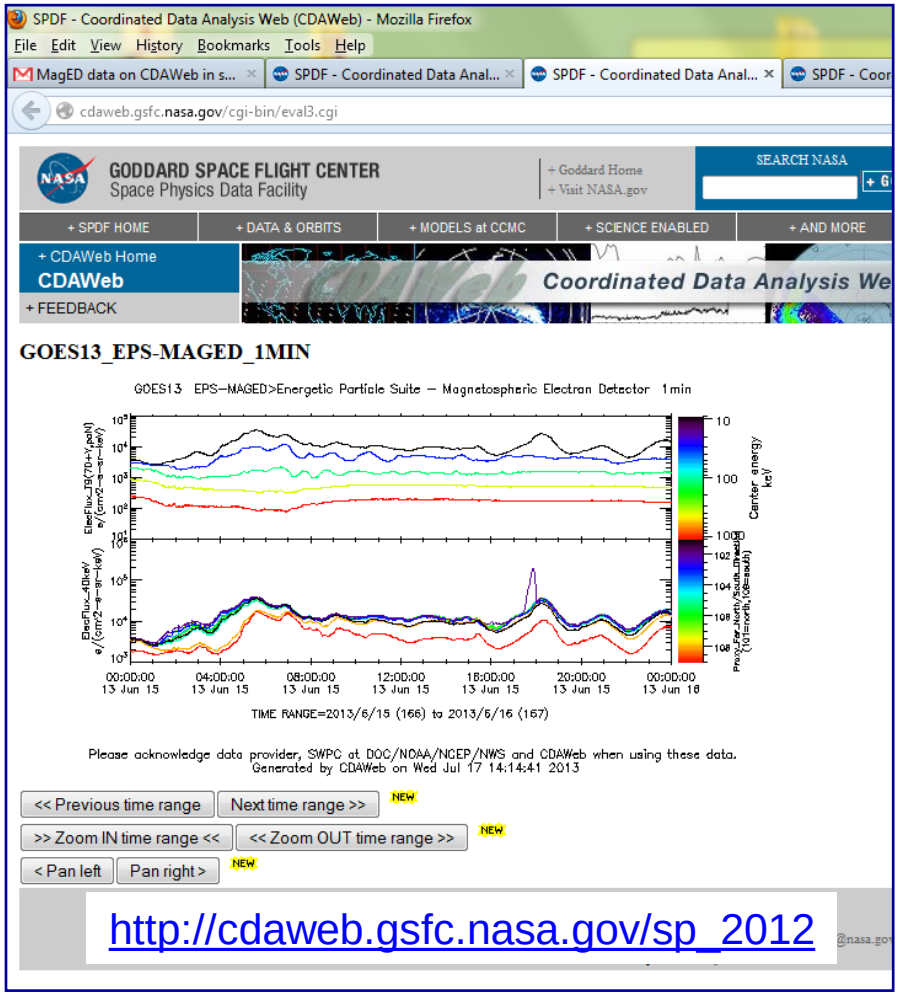
Data Priorities

- MAGED (almost done), EPEAD (underway), MAG (working data quality issues) – future: SXI?, XRS?

Benefits

- ✓ Alternate format (CDF) allows for improved user options
- ✓ CDAWeb tools allow additional browse plotting
- ✓ Easy integration with other datasets and applications such as ViRBO, Van Allen Probes, Autoplot and SPEDAS)

Note: These activities will enable future SPIDR developments.



Acronym List:

MAGED – Magnetospheric Electron Detector
EPEAD – Energetic Proton, Electron & Alpha Detector
MAG – Magnetometer
SXI – Solar X-ray Imager
VIRBO – Virtual Radiation Belt Observatory
SPEDAS – Space Physics Environment Data Analysis System
SPIDR – Space Physics Interactive Data Resource
CDAWeb – Coordinated Data Analysis Web
CDF – Common Data Format
SWPC – Space Weather Prediction Center (NWS)
GOES – Geostationary Operational Environmental Satellite (NOAA)
GOES NOP – GOES Series N-O-P Satellites

Accomplishments & Updates
Recalibration of GOES-NOP EUV Data

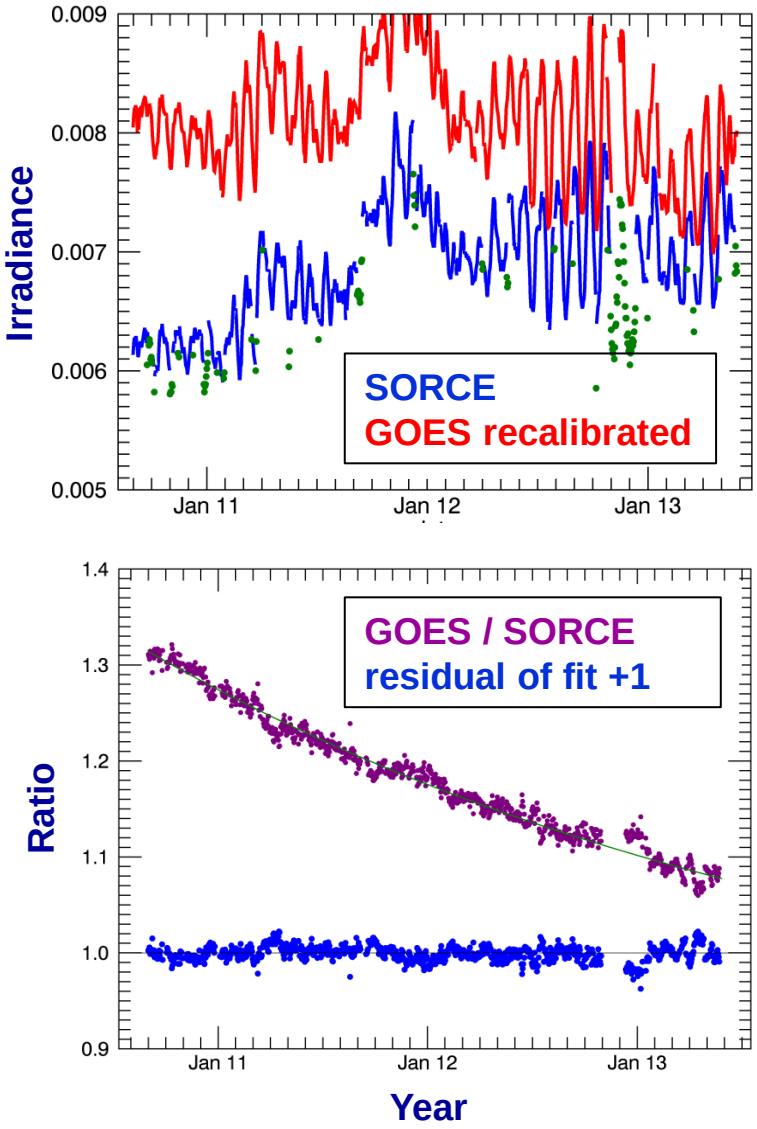
Solar X-Ray and Extreme Ultraviolet (EUV) Sensors

- Wavelength range from 0.05 nm to 125 nm
- Responsible for thermosphere heating & ionization
- Extremely variability compared to visible irradiance
- Data used for:
  - ✓ Ionosphere/thermosphere (IT) modeling
  - ✓ Satellite drag calculations by USAF

Recalibration of EUV channels A, B & E channels

- Using data from 2006 to present
- Preliminary recalibrations accurate from 3 to 10%
- Calibrated dataset forwarded to ESA colleagues to study EUV instrument on the PROBA-2 spacecraft.

Note: Proposal for re-calibration and archiving of GOES EUV sensor data submitted to *Heliophysics Infrastructure and Data Environment Enhancements (NASA)*



Acronyms:
ESA – European Space Agency
PROBA – PRoject for On-Board Autonomy
SORCE – Solar Radiation and Climate Experiment
USAF – United States Air Force

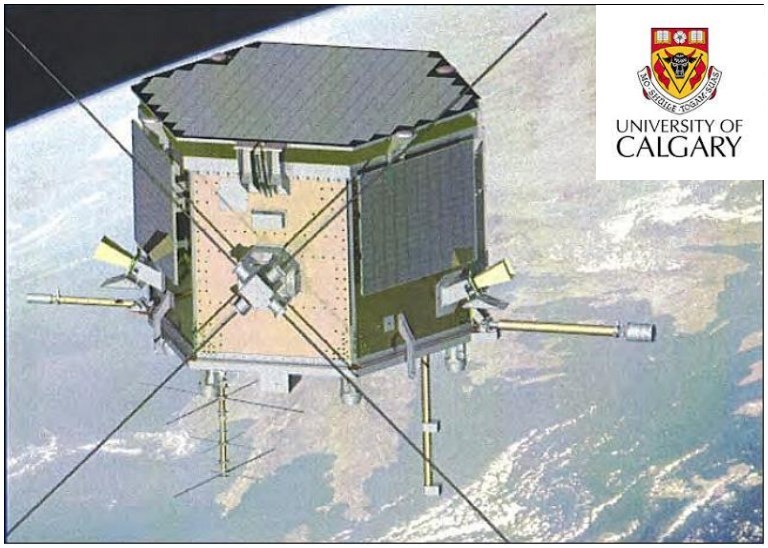
Accomplishments & Updates
Coordinated Experiment – DMSP & ePOP

ePOP – enhanced Polar Outflow Probe (Local POC: Bill Peterson/LASP)

Mission – Collect new data on space storms and associated plasma outflows in the upper atmosphere and their potentially devastating impacts on COMM, PNT & other space-based technologies.

Launch (Sept '13) – Canadian Space Agency will launch CASSIOPE / e-POP using the SpaceX Falcon rocket into elliptical 300 x 1500 km orbit (Link).

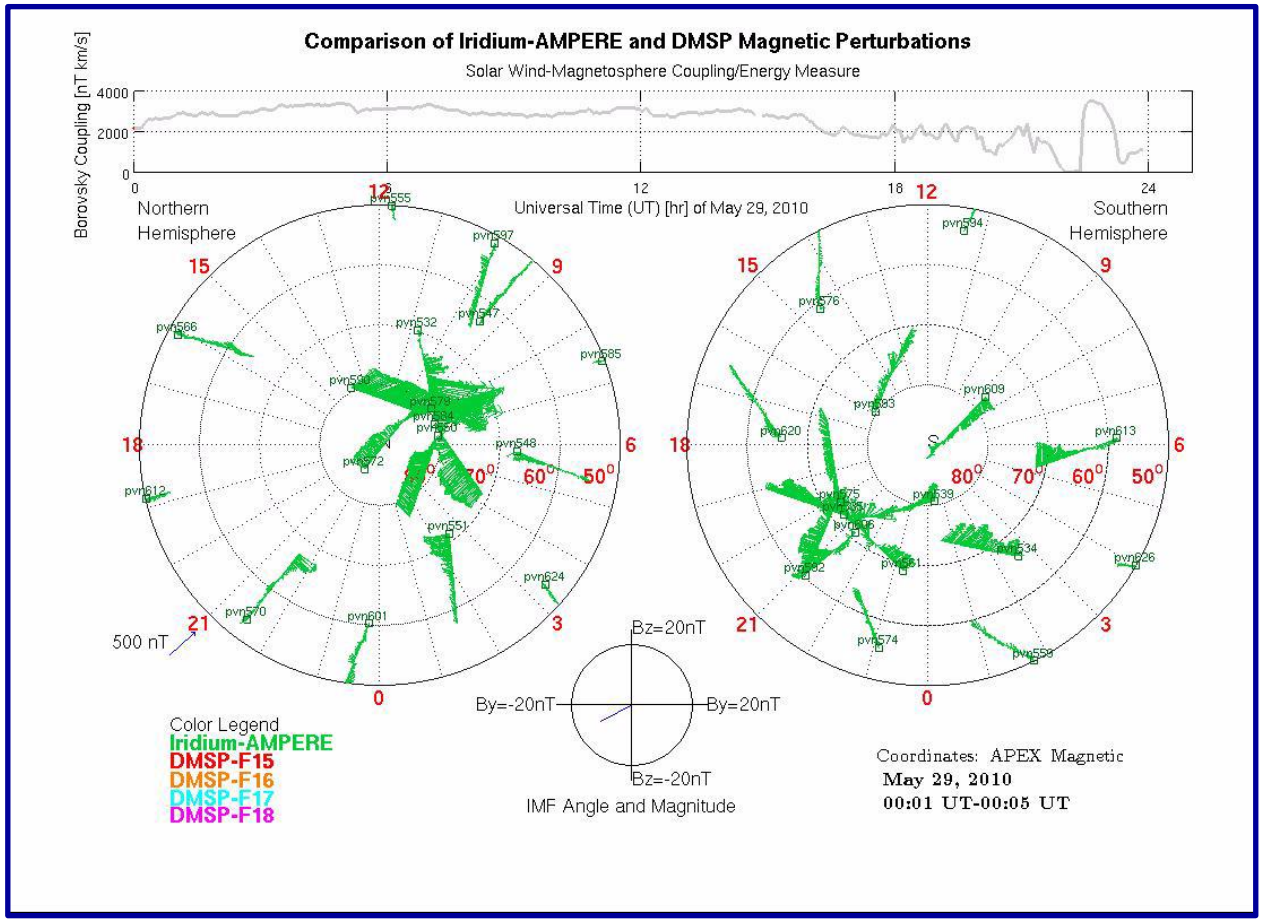
NGDC connection – Space environmental data from DMSP (and POES) will be used for coordinated/simultaneous measurements with e-POP.

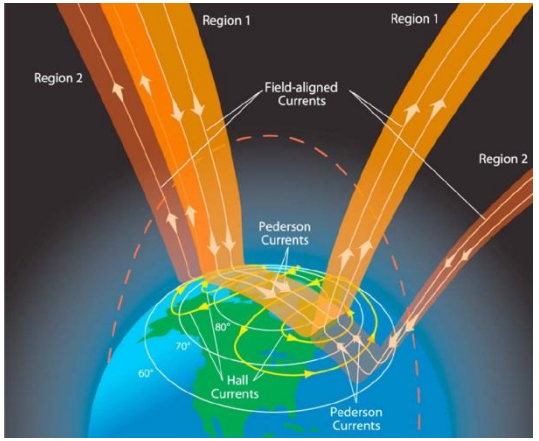


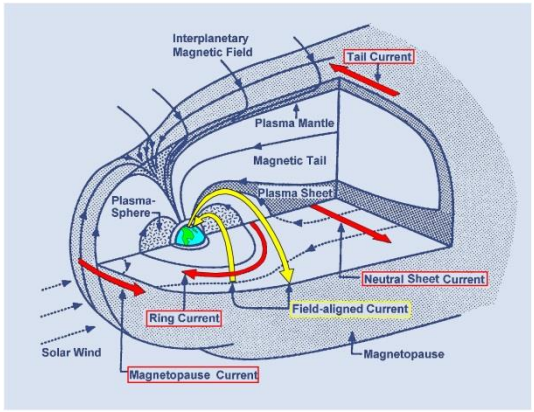
COMM – Communication
PNT – Position, Navigation and Timing
POES – Polar Operational Environmental Satellite (NOAA)
DMSP – Defense Meteorological Satellite Program (DoD/USAF)
CASSIOPE - CAScade, Smallsat and IOnospheric Polar Explorer
LASP – Laboratory for Atmospheric and Space Physics (University of Colorado)

Accomplishments & Updates

High-Latitude Field-Aligned Currents



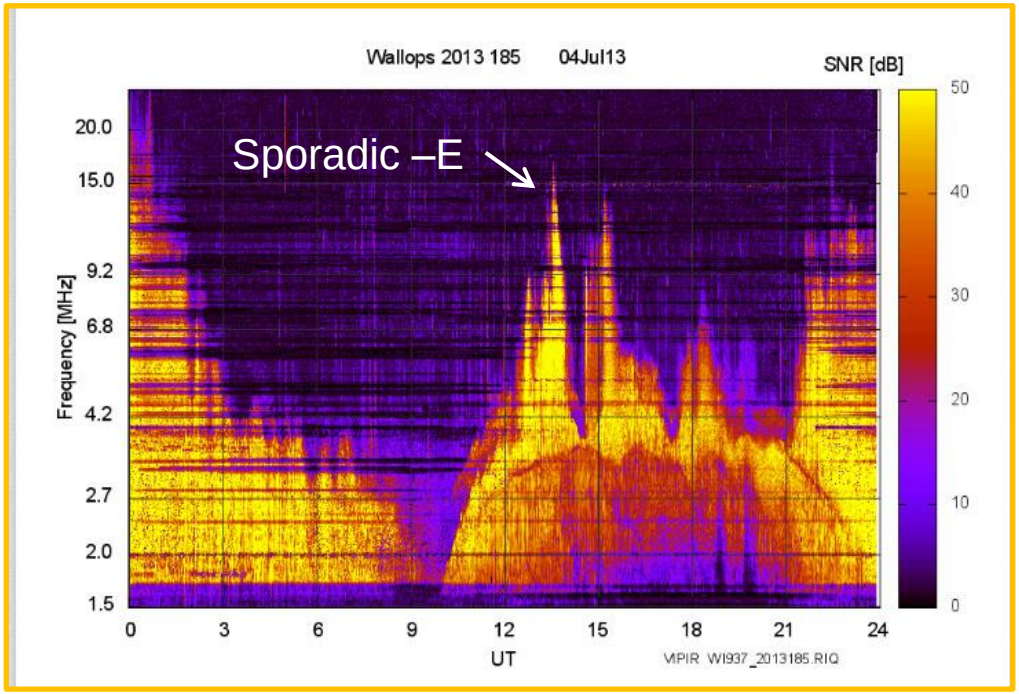


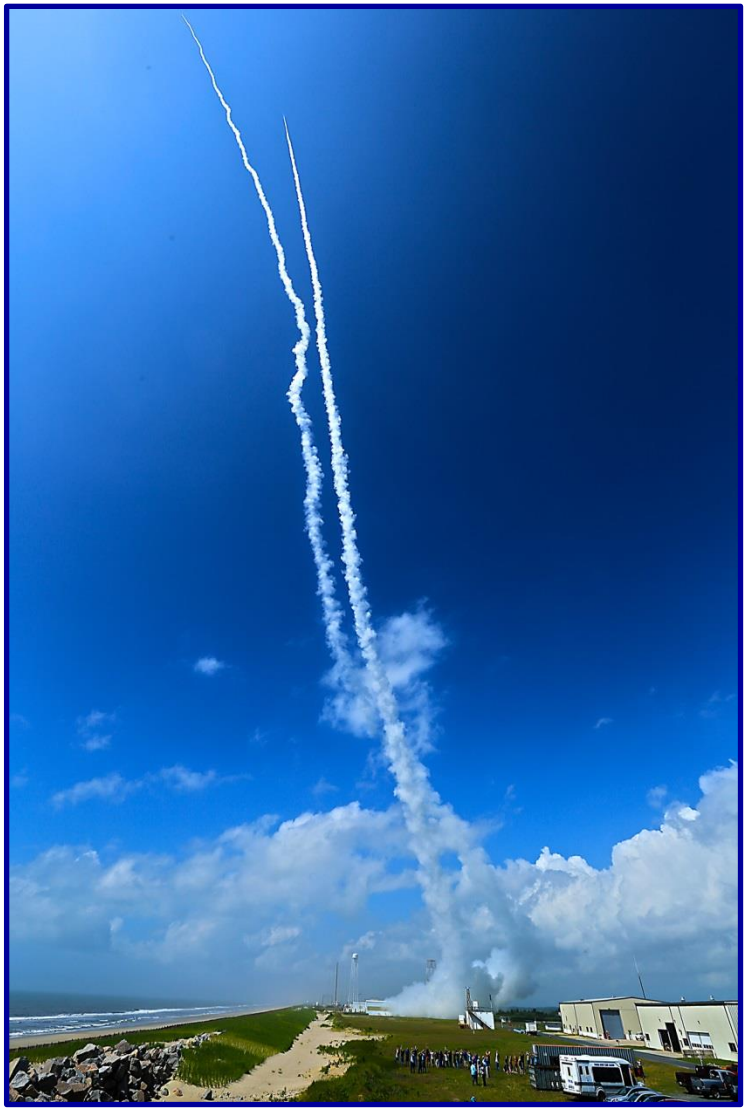


AMPERE - Active Magnetosphere and Planetary Electrodynamics Response Experiment
DMSP – Defense Meteorological Satellite Program (NGDC Dataset)

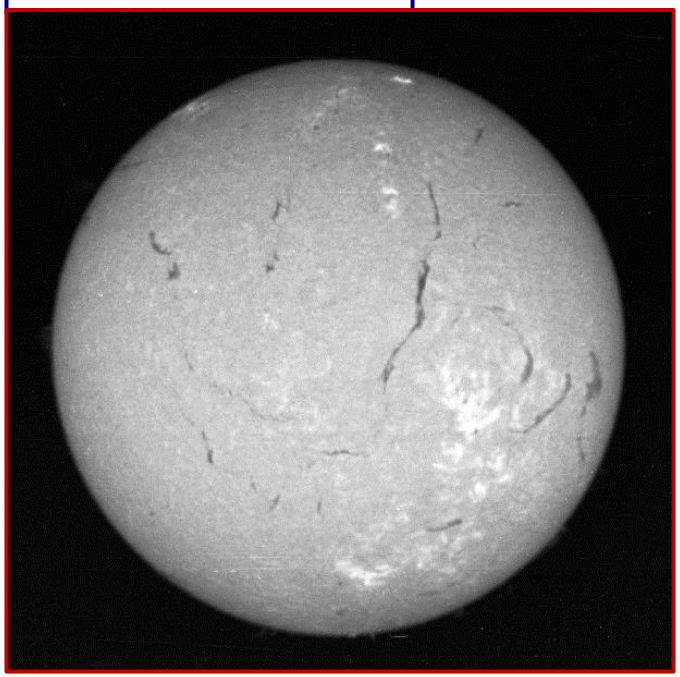
Accomplishments & Updates
Sounding Rocket Launch

Terry Bullett and Justin Mabie supported Rob Pfaff's (NASA) Daytime Dynamo Experiment. The daytime dynamo is the result of an ionospheric neutral wind creating an electric current that, in turn, can lead to the occurrence of unstable sporadic-E layers near 100 km altitude. These regions of chaotic electron density affect the reliability of radio-wave signals at mid-latitudes.





Accomplishments & Updates
WDS for Geophysics



H-alpha Solar Image
08 Mar 1989

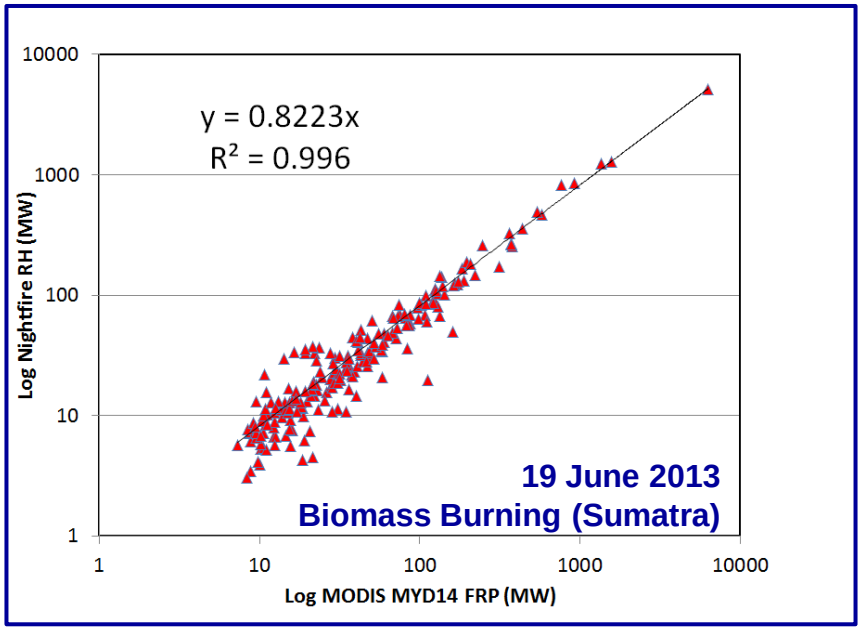
- STP handles a vast assortment of historical space weather data collected under the banner of the former World Data Center for Solar-Terrestrial Physics.
- Justin Mabie is responsible for this technology area and for interfacing with customers who rely on NGDC as a secondary provider of various indices but also as the *primary provider of other solar-terrestrial data including sunspot predictions, solar region and event summaries, and Ap*.*
- Karen Horan continues to review STP's solar imagery holdings, ensuring that all datasets use a consistent filename convention and that the historical datasets are archived.
- Craig Clark prepares and published the monthly Geomagnetic Indices Bulletin and Solar Indices Bulletin.
- *Action Required:* STP metadata references in the WDS data portal need to be reviewed/updated.

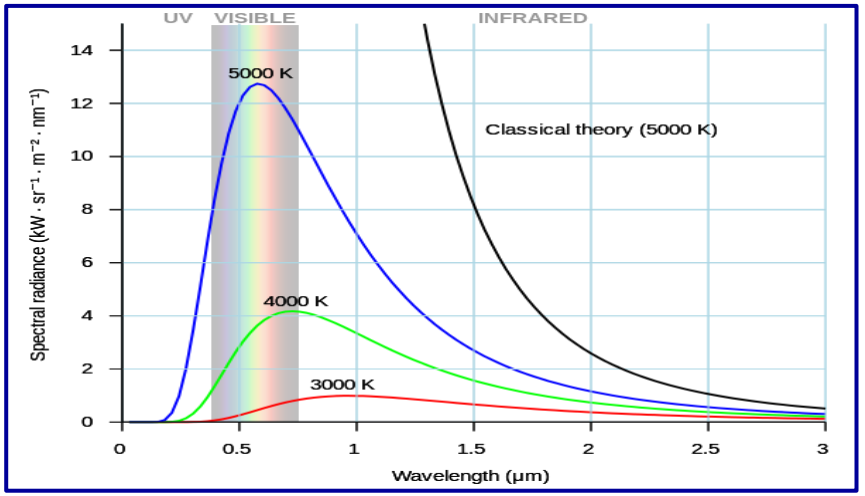
http://icsu-wds.org/

Accomplishments & Updates

Inter-calibration of VIIRS Nightfire RH

VIIRS Nightfile Radiant Heat (RH) data were found to be well correlated (1-to-1) with reported levels of MODIS Fire Radiative Power (FRP). The MODIS FRP is based on an empirical calibration to fuel consumption rates for fires burning from 600 to 1000 ºK. VIIRS Nightfire RH is derived from Planck's Law and Stefan-Boltzmann Law over the temperature range from 600 to 6,000 ºK.

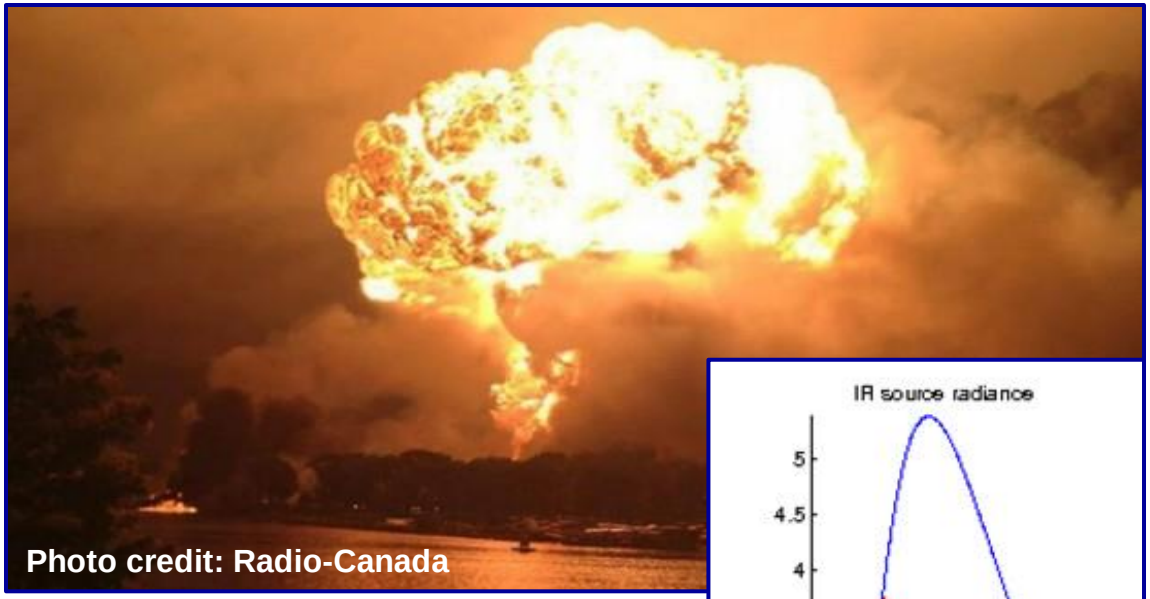


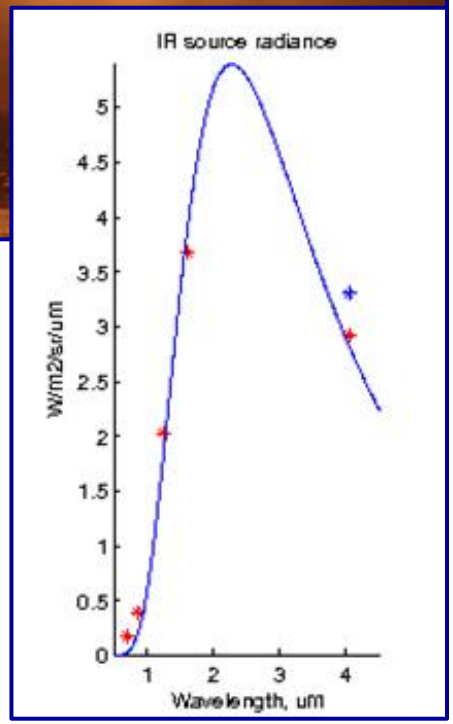


Accomplishments & Updates

Train Derailment: Lac-Magantic, Quebec

First Report: 06-Jul-2013 @ 05:15 UTC





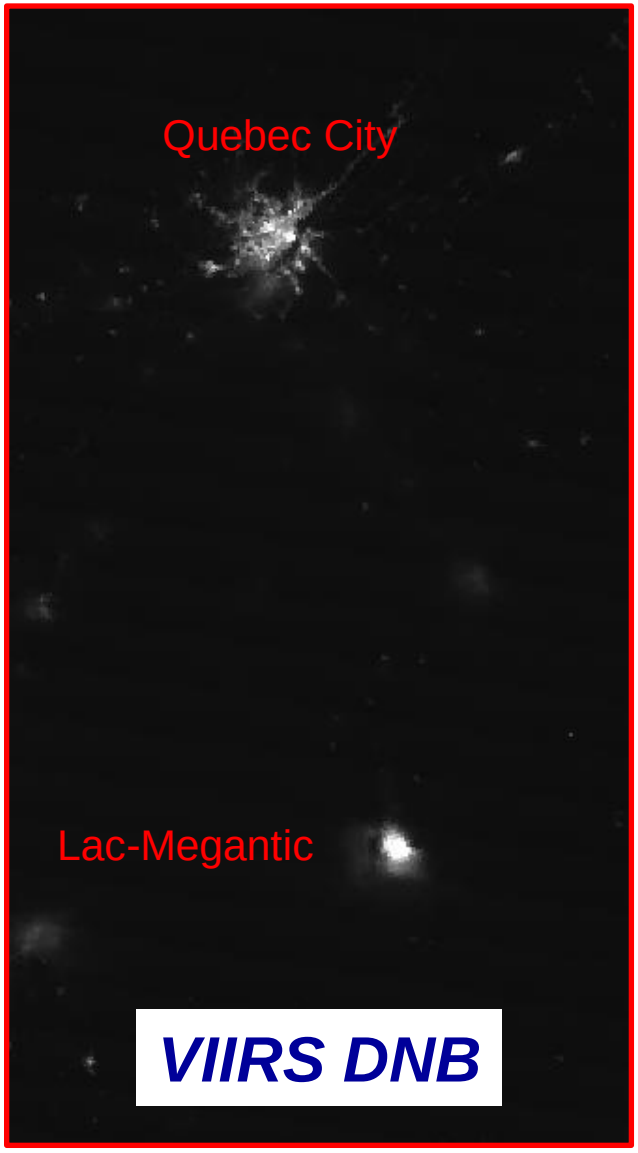
Latitude 45.58 Longitude: -70.88

Time: 06-Jul-2013 06:24:48

Cloud state: clear

Combustion parameters

- Temperature: 1,274 ^{o}K
- Radiant heat intensity: 58.64 W/m^2
- Radiant heat: 47.19 MW
- Source footprint: 315.91 m^2

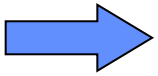


OUTLINE
Solar & Terrestrial Physics Division

STP Division Overview

Milestones & Performance Measures

Accomplishments & Updates



Publications and Presentations

Issues & Summary

Publications and Presentations
STP FY13 Publications – 17 (Pg 1 of 2)

Publications (FY13):

Araujo-Pradere, E.A., D. Buresova, **D.J. Fuller-Rowell** and T.J. Fuller-Rowell (2013), Initial results of the evaluation of IRI hmF2 performance for minima 22-23 and 23-24, *Adv. Space Res., 51,* pp.630-638. [**Peer reviewed**]

Baugh, K., **F.C. Hsu**, **C. Elvidge** and **M. Zhizhin** (2013), Nighttime Lights Compositing Using the VIIRS Day-Night Band: Preliminary Results, *Proc. Asia-Pacific Advanced Network, 35*, pp. 70-86, http://dx.doi.org/10.7125/APAN.35.8. [**Peer reviewed**]

Denig, W.F. (2012), Space Weather Products for NOAA Satellites, *Earth System Monitor, 19, p.9.*

Green, J. (2012)., Space Weather Ready, *Earth System Monitor, 19*, p.3.

Elvidge, C.D., **K. Baugh**, **M. Zhizhin** and **F.C. Hsu** (2013), Why VIIRS data are siperior to DMSP for mapping nighttime lights, *Proc. Asia-Pacific Advanced Network, 35*, pp. 62-69, http://dx.doi.org/10.7125/APAN.35.87. [**Peer reviewed**]

Elvidge, C.D., **M. Zhizhin**, **F.C Hsu** and **K. Baugh** (2013), What is so great about nighttime VIIRS data for the detection and characterization of combustion sources?, *Proc. Asia-Pacific Advanced Network, 35*, pp. 33-48, http://dx.doi.org/10.7125/APAN.35.85. [**Peer reviewed**]

Erwin, E.H., **H.E. Coffey**, **W.F. Denig**, D.M. Willis, R. Henwood and M.N. Wild (2013), The Greenwich Photo-heliographic Results (1874 – 1976): Initial Corrections to the Printed Publications, DOI 10.1007/s11207-013-0310-z [**Peer reviewed**]

Jaynes, A.N., M.R. Lessard, **J.V. Rodriguez**, E. Donovan, T.M. Loto'aniu and K. Rychert (2013), Pulsating auroral electron flux modulations in the equatorial magnetosphere, *J. Geophys. Res.*, (published online), doi: 10.1002/jgra.50434. [**Peer reviewed**]

Kyba, C.C.M., J.M. Wagner, H.U. Kuechly, C.E. Walker, **C.D. Elvidge**, F. Falchi, T. Ruhtz, J. Fischer and F. Holker (2013), Citizen Science Provides Valuable Data for Monitoring Global Night Sky Luminance, *Sci. Reports, 3*, DOI: 10.1038/srep01835.). [**Peer reviewed**]

Publications and Presentations
STP FY13 Publications – 17 (Pg 2 of 2)

YTD Publications – continued:

Machol, J.L., A.A. Reinard, R.A. Viereck and D.A. Biesecker (2013), Identification and replacement of proton-contaminated real time ACE solar wind measurements, Space Weather, (accepted manuscript online). [Peer reviewed]

Neal, J.J., C.J. Rodger, **J.C. Green**, Empirical Determination of Solar Proton Access to the Atmosphere: Impact on Polar Flight Paths, *Space Weather*, (accepted manuscript online) [**Peer reviewed**]

Rowland, W., and R.S. Weigel (2012), Intracalibration of particle detectors on a Three-axis Stabilized Geostationary Platform, *Space Weather*, 10, S11002, doi:10.1029/2012SW000816. [Peer reviewed]

Redmon, R.J., W.K. Peterson, L. Andersson, P.G. Richards (2012), Dawnward shift of the dayside O+ outflow distribution: The importance of field line history in O+ escape from the ionosphere, *J. Geophys. Res.*, http://dx.doi.org/10.1029/2012JA018145 [Peer reviewed]

Sakaguchi, K., Y. Miyoshi, E. Spanswick, E.F. Donovan, I.R. Mann, V.K. Jordanova, K. Shiokawa, M. Connors, and **J.C. Green** (2012), Visualization of ion cyclotron wave and particle interactions in the inner magnetosphere via THEMIS-ASI observations, *J. Geophys. Res.*, doi:10.1029/2012JA018180, in press. [Peer reviewed]

Willis, D.M., **H.E. Coffey**, R. Henwood, **E.H. Erwin**, D.V. Hoyt, M.N. Wild and **W.F. Denig**, The Greenwich Photo-heliographic Results (1874 – 1976): Summary of the Observations, Applications, Datasets, Definitions and Errors, accepted for publication in *Solar Physics*, DOI 10.1007/s11207-013-0311-y. [Peer reviewed]

Willis, D.M., R. Henwood, M.N. Wild, **H.E. Coffey**, **W.F. Denig**, **E.H. Erwin** and D.V. Hoyt, The Greenwich Photo-heliographic Results (1874 – 1976): Procedures for Checking and Correcting the Sunspot Digital Datasets, accepted for publication in *Solar Physics* ,. DOI 10.1007/s11207-013-0312-x. [Peer reviewed]

Zhizhin, M, **C.D. Elvidge**, **F-C. Hsu** and **K.E. Baugh** (2012), Using the Short-Wave Infraredfor Noctornal Detection of Combustion Sources in VIIRS Data, *Proc. Asia-Pacific Advanced Network, 35*, pp. 49-61, http://dx.doi.org/10.7125/APAN.35.6. [**Peer reviewed**]

Total accepted or published: 17

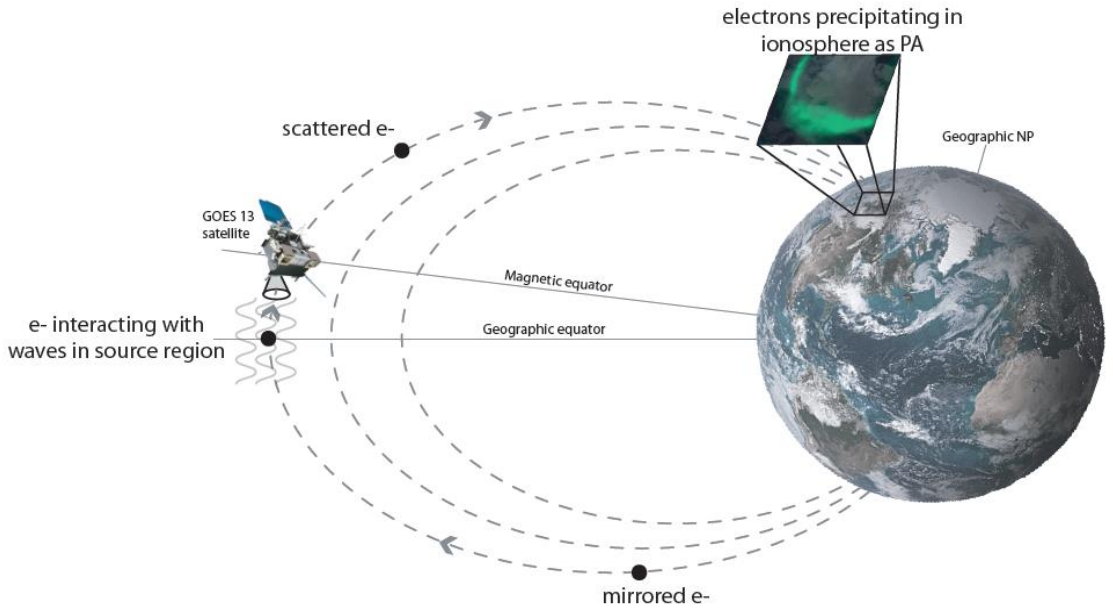
- **Peer Reviewed: 15 (AOP metric)**

Publications and Presentations
Mechanism for Pulsating Aurora

Recent Paper: Pulsating auroral electron flux modulations in the equatorial magnetosphere

Authors: Jaynes, A.N., M.R. Lessard, **J.V. Rodriguez**, E. Donovan, T.M. Loto'aniu and K. Rychert (2013)

Journal: Journal of Geophysical Research (Blue)



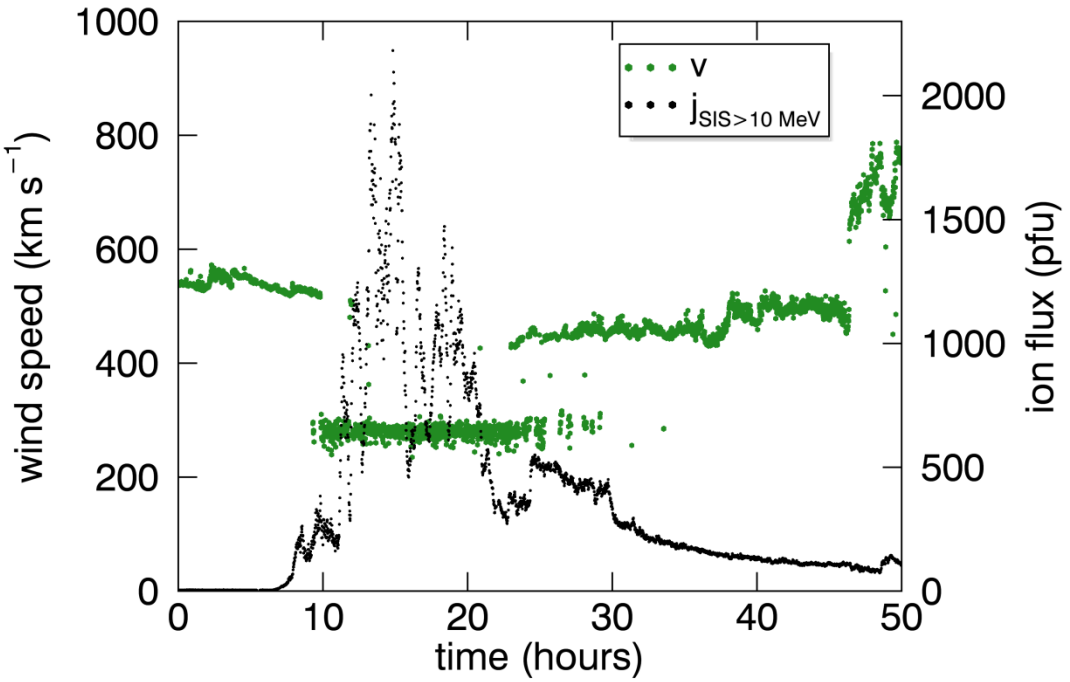
Conceptual drawing of a potential VLF wave scattering mechanism that drives pulsating aurora.

Publications and Presentations
Interplanetary Data Continuity

Recent Paper: Identification and replacement of proton-contaminated real time ACE solar wind measurements

Authors: Janet Machol, Alysha Reinard, Rodney Viereck & Doug Biesecker

Journal: Space Weather



Example of an outage for ACE solar wind speed that occurred on 3-4 April 2001.

Publications and Proceedings
Impacted Night Sky Luminance

Recent Paper: Citizen Science Provides Valuable Data for Monitoring Global Night Sky Luminance

Authors: Kyba, C.C.M., J.M. Wagner, H.U. Kuechly, C.E. Walker, **C.D. Elvidge**, F. Falchi, T. Ruhtz, J. Fischer and F. Holker

Journal: Science Reports

Skyglow reduces the visibility of celestial objects for both the human eye and consumer cameras.

GLOBE at Night project

Publications and Presentations
Correcting the Solar Records – Trifecta

Recent Paper: The Greenwich Photo-heliographic Results (1874 – 1976): Initial Corrections to the Printed Publications (Paper #3 of 3)

Authors: E.H. Erwin, **H.E. Coffey**, **W.F. Denig**, D.M. Willis, R. Henwood and M.N. Wild,

Journal: Solar Physics

Publication is the last of a 3-part series identifying/correcting errors in the historical Greenwich solar records.

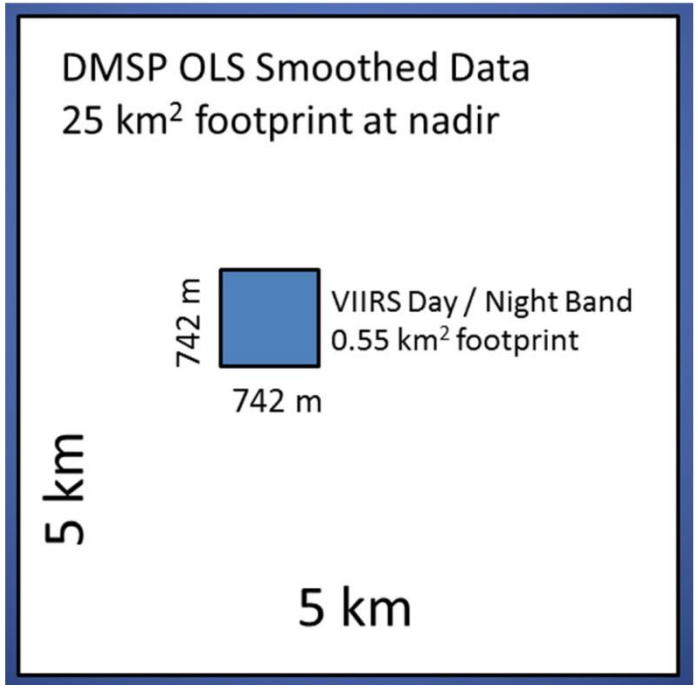
Note: The entire record of Greenwich solar record (publications) are available at: ftp://ftp.ngdc.noaa.gov/STP/publications/miscellaneous/greenwich_publications/

Publications and Presentations
VIIRS vs OLS – Quadfecta

Paper: Why VIIRS Data are Superior to DMSP for Mapping Nighttime Lights (Paper #1 of 4)

Authors: C.D. Elvidge, K. Baugh, M. Zhizhin and F.C. Hsu

Journal: Proceedings of the Asia-Pacific Advanced Network (Refereed)



Four publications from the EOG were published in the APAN Proceedings on the use of VIIRS and its benefits over DMSP/OLS.

VIIRS – Visible Infrared Imaging Radiometer Suite
DMSP – Defense Meteorological Satellite Program
EOG – Earth Observation Group (C. Elvidge)
OLS – Operational Linescan System

Publications and Presentations
Other Professional Activities

Submitted NASA Proposals (FY13 YTD):

Data Services Upgrade to the GOES Solar Extreme Ultraviolet Irradiance Measurements, *submitted to Heliophysics Infrastructure and Data Environment Enhancements (NASA)*, **J. Machol**, A. Milan, **W. Denig**, R. Viereck, A. Jones and F. Hill

47 years of magnetism: Preserving a unique archive for long-term solar variability studies, *submitted to Heliophysics Infrastructure and Data Environment Enhancements (NASA)*, A. Reinard, R. McFadden, I. Hewins, F. Hill and **W. Denig**

Magnetosphere-Ionosphere coupling during strong forcing of the magnetosphere by the solar wind as monitored by ground-satellite conjunctions across the auroral oval, *submitted to Heliophysics Supporting Research (NASA)*, C. Farrugia, P.E. Sandholt and **W. Denig**

Polar Cap Auroral Fine Structure: Origins, *submitted to Heliophysics Supporting Research (NASA)*, M. Samara, R. Michell and **R. Redmon**.

Solar wind driving of magnetospheric ULF power and consequences for radiation belt dynamics, *submitted to Heliophysics LWS Science (NASA)*, S. Elkington, M. Wiltberger, **R. Redmon**, S. Kanekal, D. Malaspina, H. Singer, I. Mann and S. Claudepierre.

Data Services Upgrade: Enabling heliophysics climatology research with improved POES/MetOp particle data**,** *submitted to Heliophysics Infrastructure and Data Environment Enhancements (NASA)*, S.Huston, **J.C. Green** and C. Randall

From Sun to Earth - Forecasting and understanding the geomagnetic effects of solar wind originating in coronal holes, *submitted to Heliophysics Targeted Research and Technology (NASA),* L.Krista, **J.V. Rodriguez** and **J.C. Green**

Will we recognize the space weather tsunami?, *submitted to Heliophysics Targeted Research and Technology (NASA),* **J.C. Green**, Y. Shprits, J. Rigler, P. O'Brien, T. Onsager, R. Rutledge

Drift phase structure as a diagnostic of different radial transport mechanisms in the outer radiation belt, *submitted to Heliophysics Targeted Research and Technology (NASA),* T.P. O'Brien, T. Mulligan, **J.C. Green** and I. Mann

Quantifying the correlation between chorus waves, energetic electron precipitation, and diffuse aurora and their dependence on solar wind activity, *submitted to Heliophysics Supporting Research (NASA),* W. Li, J. Bortnik, Y. Nishimura, B. Ni and **J. C. Green**

Journal Refereed Reports (FY13 YTD):

R. Redmon – JGR-Blue (May 2013)

J. Green – JGR-Blue (Oct 2012); JGR-Blue (Dec 2012); Science (Feb 2013)

W. Denig – JGR-Blue (Dec 2012); JGR-Blue (Jul 2013), JGR-Blue (21 Jul 2013)

C. Elvidge – J-STARS (IEEE), Remote Sensing (3), EOS (AGU), Remote Sensing Envir. (2), Intl J. Remote Sensing (2), GISci Remote Sensing, ISPRS J Photogrammetry & Remote Sensing, Proc. APAN, Sociological Meth., PLOS ONE, Geosci Remote Sens. Lett., Bull. AMS

OUTLINE
Solar & Terrestrial Physics Division

STP Division Overview

Milestones & Performance Measures

Accomplishments & Updates

Publications and Presentations

Issues & Summary

Issues & Summary
GOES Program Issues

Frozen Baseline / Algorithm Readiness – The GOES-R program has frozen the L1b algorithm baseline using early versions of the ATBDs (aka CDRL 80). There are assurances that "*NESDIS will fix algoriths post launch*".

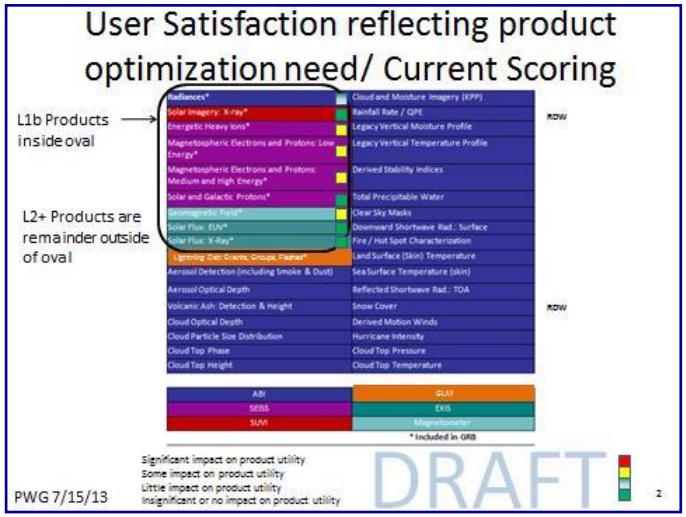
➡ Mitigation: *Steve Goodman recommends that NGDC implement its own L1b algorithms (see slide X).*

GOES L0 Data Not in CLASS – NESDIS has decided not to have GOES-R L0 data archived in CLASS (31-May-2013). This will have a negative impact on our ability to support L1b cal/val.

➡ Mitigation: *Program plans to make L0 data available (via Wallops) for up to 2 years. Details are TBD. Reference Kihn-Baker discussions.*

GOES-R Data Management Tasks – The data centers have assumed additional responsibilities regarding the AAA of GOES-R environmental data. Previously considered a "campaign" dataset, this is putting additional burden on existing staff.

➡ Mitigation: *Fill 1 of 2 available Fed slots to a GOES-R satellite data manager.*



L0 Data Volume Requirements (Space Weather)

Instr-ument	Justification	Freq-uency	Data Rate (GBytes/ Wk)	Data Rate Fraction	Total (GBytes /Wk)
EXIS	• L1b Alg Assessment, Anomaly Resolution and Revision • Calibration Assessment, Monitoring and Anomaly Resolution	All Data	3.78 (Assumed 50 Mbps)	1.00	3.78
MAG	• L1b Alg Assessment, Anomaly Resolution and Revision • State information for MAG components, other sensors, and spacecraft systems contained in the L0 data is needed to identify and mitigate interference in the MAG product.	All Data	0.13 (2 kbps)	1.00	0.13
SEISS	• L1b Alg Assessment, Anomaly Resolution and Revision • Instrument Performance and Calibration Assessment and Anomaly Resolution - Requires inflight calibration, singles, and pulse-height-analysis data that will only be available only in the L0 data. • Post-launch cal/val methods, such as inter-calibration of detectors and inter-calibration with other satellites, cannot be performed without L0 data.	All Data	0.34 (Assumed 4.46 Mbps per GS CDR)	1.00	0.34
SUVI	• L1b Alg Assessment, Anomaly Resolution and Revision • EXIS L0 data also needed for inter-comparison between the EXIS-EUVS/A and SUVI to maintain SUVI L1b accuracy.	All Data	264.60 (Assumed 3.5 Mbps)	1.00	264.60

L0 Requirements for All Instruments:
During PLT – 5885.95 Gbytes/Week or 306.07 Tbytes/Year
Operationally – 3046.23 Gbytes/Week or 158.40 Tbytes/Year

Issues & Summary

Solar & Terrestrial Physics Division

- ✓ **Federal travel restrictions limit program growth (4QFY12) – active**
- ✓ **Fed hiring restrictions having mission impact (3QFY12) – *critical***
- ✓ **GOES-R L2+ SWx algorithms (3QFY11) – *RFP (slide #19/NWS AoA)***

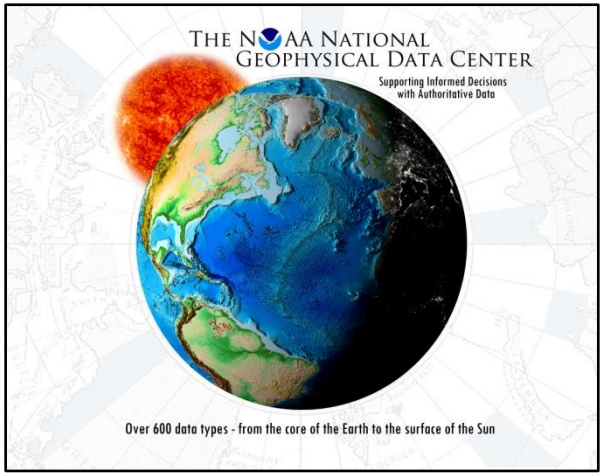
Metrics

Papers Published (FY13 YTD): 17

- ✓ Peer Reviewed: 15

Presentations (FY13 YTD): 39

- ✓ List to follow



QUESTIONS?

"Kids say the darndest things"

Publications and Presentations
STP FY13 Presentations – 40 (1 of 3)

YTD Presentations (FY13):

High Energy Particle Precipitation into the Atmosphere (HEPPA) – 09-11 October 2012, Boulder, CO

- Update on the NOAA Polar Satellite Program, Data, and Products (Poster), **J. Machol**, **J. Green**, **W. Denig**, T. Sotirelis, **D. Wilkinson**, **J. Rodriguez** and **R. Redmon**

Extreme Ultraviolet Variability Experiment (EVE) Science Meeting - 31 October -1 November 2012, Yosemite Valley, CA

- The Use of EVE Data at NOAA (Invited Oral), **J. Machol**

Conference on Space Environment Applications, Systems, and Operations for National Security (SEASONS), 14-16 November 2012, Laurel, MD

- NOAA Satellite Anomaly Program (Oral), **J.C. Green** (Paper presented by G. Fish)

American Geophysical Union, 03-07 December 2012, San Francisco, CA

- Intracalibration of Particle Detectors on a Three-Axis Stabilized Geostationary Platform (Poster), **W. Rowland**, and R. Weigel, (Paper: SM31B-2304)
- New NOAA resources for safeguarding the satellite infrastructure from space weather (Poster), **J.C. Green**; **W.F. Denig**; **J.V. Rodriguez**; **R.J. Redmon**; T.G. Onsager, H.J. Singer, W. Murtagh, R. Rutledge, J. Stankiewicz, J. Kunches and **D.C. Wilkinson** (Paper: SM23B-2316)
- NOAA People Empowered Products (PeEP): Combining social media with scientific models to provide eye-witness confirmed products (Oral), **S. Codrescu, J.C. Green**, **R.J. Redmon**, **W.F. Denig** and **E.A. Kihn** (Paper: IN23F-02) (Paper presented by J. Rodriguez)
- Non-standard Space Weather Products and Services from NOAA (Oral), **W.F. Denig** and R.A. Viereck (Paper: IN31D-03)
- Dawnward shift of the dayside O+ outflow distribution and the Influence of e- precipitation on ion upwelling in the nightside auroral zone (Poster), **R.J. Redmo**n, L. Andersson, W.K. Peterson and P.G. Richards (Paper: SM41B-2215)
- GOES Observations of Pitch Angle Evolution During an Electron Radiation Belt Dropout (Poster), D.P. Hartley, M.H. Denton, **J.C. Green**, T.G. Onsager**, J.V. Rodriguez** and H.J. Singer (Paper: SM31C-234)
- Numerical Simulations of the Ring Current During Geomagnetic Storms (Invited Oral) M.W. Chen, C.Lemon, T.B. Guild, M. Schulz; J.L. Roeder; A.Lui, A.M. Keesee, J.Goldstein, G. Le and **J.V. Rodriguez** (Paper: SM32A-03)

ftp://ftp.ngdc.noaa.gov/STP/publications/stp_presentations/stp_presentations.pdf

Publications and Presentations
STP FY13 Presentations – 40 (2 of 3)

YTD Presentations (continued):

American Geophysical Union, 03-07 December 2012, San Francisco, CA (continued)

- Pulsating Aurora: the Equatorial Source Population & Local Morphological Interplay with Diffuse Aurora (Poster), A.N. Jaynes, M. Lessard, **J.V. Rodriguez**, K.M. Rychert, E. Donovan, R.G. Michell and M. Samara (Paper: SM43B-2240)
- Comparison of Geomagnetically-shielded Solar Energetic Proton Fluxes Observed at Geostationary Orbit by GOES and in Low-earth Orbit by SAMPEX, POES and MetOp (Poster**), J.V. Rodriguez**, J.E. Mazur, **J.C. Green** and **J.L. Machol** (Paper: SH33C-2243)
- Real-time mapping of combustion sources using Suomi NPP satellite VIIRS and CrIMSS data (Poster), **M Zhizhin**, **C. Elvidge**, **K. Baugh** and **F.C. Hsu** (Paper: IN33C-1553)

American Meteorological Society, 06-10 January 2013, Austin, TX

- The GOES-R Sudden Impulse Detection Algorithm (Poster), **W. Rowland**, **R. Redmon** and H.J. Singer (Paper 315)
- GOES-R solar extreme-ultraviolet irradiance: requirements, observations, and products (Poster), **J.L. Machol**, R.A. Viereck, A. Reinard, F.G. Eparvier, M.Snow, A.R. Jones, T.N. Woods, **W.F. Denig**, D.L. Woodraska and S. W. Mueller (Paper 304)
- Development of a Proxy Data Set for the Energetic Heavy Ion Sensor (EHIS) in the GOES-R Space Environment In-Situ Suite (Poster), **R. Bharath**, **J.V. Rodriguez**, **J.C. Green** and **W.F. Denig** (Paper 296)
- Improved Space Weather Monitoring for GOES-R (Invited Oral), **W.F. Denig** and S.M. Hill (Paper J2.4)
- Automatic Analysis of EUV Solar Features using Solar Imagery for the GOES-R SUVI (Poster), **J.M. Darnel**, S.M. Hill and **W.F. Denig** (Paper 660)

Asia Pacific Advanced Network (APAN), 13-18 January 2013, Honolulu, HI

- What is so great about nighttime VIIRS data for the detection and characterization of combustion sources? (Oral), **C. Elvidge**
- Using the short-wave infrared for nocturnal detection of combustion sources in VIIRS data (Oral), **M. Zhizhin**
- Estimating temperature and total radiant output for combustion sources detected at night in VIIRS data (Oral), **Feng-Chi Hsu**
- Ranking gas flares based on radiant output (Oral), **K. Baugh**
- Why VIIRS data are superior to DMSP for mapping nocturnal lighting (Oral), **C. Elvidge**
- A stray filter for improving the quality of VIIRS low light imaging data (Oral), **M. Zhizhin**
- The NGDC VIIRS reprojection toolkit (Oral), **M. Zhizhin**
- A VIIRS cloud detection system optimized for cloud-free compositing (Oral), **Feng-Chi Hsu**
- VIIRS cloud-free compositing for nighttime lights (Oral), **K. Baugh**

Publications and Presentations
STP FY13 Presentations – 40 (3 of 3)

YTD Presentations (continued):

Earth-Sun System Exploration 5 - January 13-19, Kona, HI

- Creation and analysis of a novel auroral dataset derived from DMSP satellite observations (Poster), **J.V. Mills**, **R.J. Redmon**, W. K. Peterson, L. Andersson and **W.F. Denig**.
- Dynamic auroral boundaries and ion energization: Solar cycle 23 (Oral, Invited), **R.J. Redmon**, W.K. Peterson, L. Andersson, P.G. Richards, **W.F. Denig** and **J. Mills**

Boulder Solar Days

- Using GOES-R Data for Solar Observations (oral), **J. Darnel**

NOAA Satellite Conference,08-12 Apr 2013, College Park, MD

- Societal Impacts of Space Weather (Poster), **W.F. Denig** and S. Hill

Space Weather Workshop – 16-19 April 2013, Boulder, CO

- NOAA Resources for Safeguarding the Satellite Infrastructure from Space Weather (Oral), **J.C. Green**
- NOAA Operational Space Environmental Monitoring – Current Capabilities and Future Directions (Oral), **W.F. Denig** and **P. Mulligan**
- Intercalibration of GOES 8-15 Solar Proton Measurements (Poster), **J. Rodriguez**
- A High Resolution Observation of an Ionospheric Disturbance Over Hurricane Sandy (Poster), **J. Mabie, K. Horan and T. Bullett**

Workshop on Inter-Calibration and Degradation of EUV Instruments – 15-18 April 2013, Brussels, Belgium

- Preliminary calibrations of GOES EUVS (Oral), **J. Machol**

Spacecraft Anomalies and Failures Workshop – 05 June 2013, Chantilly, MD

- NOAA resources for safeguarding the satellite infrastructure from space weather (Oral) **Green, J.C., W. Denig, J. Rodriguez, R. Redmon, S. Codrescu**, T. Onsager, H. Singer, W. Murtagh, R. Rutledge, J. Stankiewicz, J. Kunches, **D. Wilkinson,** M. Mullholland

Geospace Environment Modeling (GEM) Workshop, 16-21 June 2013, Snowmass, CO

- New NOAA data , products and research on Earth's radiation environment, (Poster) **Green, J.C, W. Denig, J. Rodriguez, R. Redmon, S. Coderescu**, T. Onsager, H. Singer
- Using crowd sourced auroral observations to validate OVATION, **S. Codrescu**, Kelton Minor, **J. Green, R. Redmon**

Space Foundation Teachers, 13 Jun & 20 Jun 2013, Boulder, CO

- NOAA Satellites and Data Centers, **W. Denig**